

# Ricardo R. Muñoz

## Curriculum Vitae

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CONTACT INFORMATION      Yale University  
Astronomy Department  
260 Whitney Avenue, JWG 212  
New Haven, Connecticut 06511  
*Phone: (203) 432-3016*  
*Fax: (203) 432-3824*  
*e-mail: ricardo.munoz@yale.edu*

CITIZENSHIP      Chilean

EDUCATION      UNIVERSITY OF VIRGINIA, Department of Astronomy  
Ph.D., Astronomy, **August 2008** (Advisor: Prof. Steven R. Majewski)  
Dissertation: Mapping Galactic Halo and Dwarf Spheroidal Structure with Giant Stars  
M.S., Astronomy, **May 2004**  
UNIVERSIDAD DE CONCEPCION, Chile  
B.A., Chemical Engineering, **May 2000**

APPOINTMENTS      YALE UNIVERSITY, **September 2008-present** Postdoctoral Associate

AWARDS      Award for Excellence in Scholarship in the Sciences, Awarded by the University of Virginia, 2007  
Universidad de Concepción Award, in the career of Chemical Engineering, as the Best Student of the 2000 Class. Awarded by the University of Concepción, Chile, 2000  
Facultad de Ingenieria Award, Chemical Engineering, Awarded by the Engineering Department, University of Concepción, Chile, 2000

GRANTS AND FELLOWSHIPS      Farrar Graduate Fellowship, Astronomy Department, U. of Virginia, 2007  
Robert J. Huskey Travel Fellowship, U. of Virginia, 2004, 2005 and 2006  
International Travel Grant, American Astronomical Society, 2006 and 2009  
F. H. Levinson Graduate Fellowship, U. of Virginia, 2003–2006  
Hamilton Graduate Fellowship, School of Arts & Sciences, U. of Virginia, 2002–2004  
Presidential Fellowship, U. of Virginia, 2002–2004  
Conicyt Doctoral Fellowship, Chilean Committee for Science and Technology, 2002  
Physics Department Graduate Fellowship, Physics Department, U. of Concepción, Chile, 2001–2002  
Graduate School Fellowship, U. of Concepción, Chile, 2000–2001

TEACHING EXPERIENCE      1999 - 2001 Teaching Assistant, Introduction to Physics, U. de Concepcion.  
2007 (Fall) Teaching Assistant, Introduction to the Sky and Solar System, U. of Virginia.

PREVIOUS EMPLOYMENT AND AFFILIATION      2000 (Summer) Telescope Assistant, 2.2m telescope, La Silla Observatory, Chile  
1999 (Summer) Telescope Assistant, 2.2m telescope, La Silla Observatory, Chile

SELECTED  
TELESCOPE  
ALLOCATIONS

CTIO-Blanco, HYDRA  
“Exploring the Tidal Tails of the Carina dSph and the Extended Structure of the Large Magellanic Cloud”, 2008B, **PI**

WIYN-3.5m, HYDRA  
“Mapping of Two Newly Discovered Halo Substructure in the Grid Giant Star Survey”, 2008A, **PI**

CTIO-Blanco, HYDRA  
“Exploring the Tidal Tails of the Carina dSph”, 2007B, **PI**

Keck-II, DEIMOS  
“A New Problem for Lambda-CDM on Small Scales: Too Many Tidally Disrupting dSphs?”, 2009A, **Co-I**

Gemini-N, GEIMOS  
“A New Problem for Lambda-CDM on Small Scales: Too Many Tidally Disrupting dSphs?”, 2009A, **Co-I**

CTIO-Blanco, MOSAIC/HYDRA  
“A New Component of the Large Magellanic Clouds: Stellar Halo or Tidal Debris?”, 2007B, **Co-I**

SOAR, OSIRIS  
“Mapping the Dynamics of the Milky Way with 2MASS and GLIMPSE: Stellar Tracers of the Galactic Bar”, 2007B, **Co-I**

OBSERVING  
EXPERIENCE

19 nights: Swope 1-m telescope CCD imaging  
7 nights: Swope 1-m telescope MODSpec spectroscopy  
12 nights: Du Pont 2.5-m telescope CCD imaging  
6 nights: Du Pont 2.5-m telescope MODSpec spectroscopy  
2 nights: 2.2m ESO telescope WFI imaging  
4 nights: KPNO 4-m telescope MOSAIC imaging  
6 nights: WIYN 3.5-m telescope MINIMO imaging  
30 nights: WIYN 3.5-m telescope HYDRA spectroscopy  
25 nights: Blanco 4-m telescope HYDRA spectroscopy  
5 nights: CTIO 1.5-m telescope RCSpec spectroscopy  
1 night: 3.5m NTT-ESO telescope CCD imaging  
3 night: Magellan 6.5m telescope MIKE spectroscopy  
3 night: SOAR 4m telescope OSIRIS spectroscopy

MISCELLANEOUS

Publications cited more than 400 times to date (170 for first author papers).

Referee for ApJ.

Referee for ApJ Letters.

2009 (July 13-24) Attended the Mini Study Program “Shedding Light on the Nature of Dark Matter” at the Keck Institute for Space Studies, Caltech, Pasadena, CA

2007 (4-10 March) Attended 37<sup>th</sup> Saas-Fee advanced course of the Swiss Society for Astrophysics and Astronomy, “The Origin of the Galaxy and Local Group”, Mürren, Switzerland

FIRST AUTHOR  
REFEREED  
PUBLICATIONS

**Muñoz R. R.**, Geha, M., & Willman, B. “Turning the Tides on the Coma Berenices and Ursa Major Dwarf Spheroidal Galaxies,” 2009, *Astrophysical Journal*, submitted

**Muñoz R. R.**, Majewski, S. R., & Johnston, K. V. “Modeling the Structure and Dynamics of Dwarf Spheroidal Galaxies with Dark Matter and Tides,” 2008, *Astrophysical Journal*, 679, 346

**Muñoz R. R.**, Majewski, S. R., Zaggia, S., Kunkel, W. E., Frinchaboy, P. M., Nidever, D. L., Crnojevic, D., Patterson, R. J., Crane, J., Johnston, K. V., Sohn, S. T., Bernstein, R. & Shectman, S. “Exploring Halo Substructure with Giant Stars XI: The Tidal Tails of the Carina Dwarf Spheroidal Galaxy and the Discovery of Magellanic Cloud Stars in the Carina Foreground,” 2006a, *Astrophysical Journal*, 649, 201

**Muñoz R. R.**, Carlin, J. L., Frinchaboy, P. M., Nidever, D. L., Majewski, S. R., & Patterson, R. J. “Exploring Halo Substructure with Giant Stars: The Dynamics and Metallicity of the Dwarf Spheroidal in Boötes,” 2006b, *Astrophysical Journal*, 650, L51

**Muñoz R. R.**, Frinchaboy, P. M., Majewski, S. R., Kuhn, J. R., Chou, M.-Y., Palma, C., Sohn, S., Patterson, R. J. & Siegel, M. H, “Exploring Halo Substructure with Giant Stars: The Velocity Dispersion Profiles of the Ursa Minor and Draco Dwarf Spheroidals At Large Angular Separations,” 2005, *Astrophysical Journal*, 631, L137

CO-AUTHOR  
REFEREED  
PUBLICATIONS

Wolf, J., Martinez, G. D, Bullock, J. S., Kaplinghat, M., Geha, M., **Muñoz R. R.**, Simon, J. D., & Avedo, F. F. “Accurately Determining Masses of Spheroidal Galaxies Without a priori Knowledge of Stellar Anisotropy,” 2009, *MNRAS*, submitted

Carlin, J. L., Grillmair, C., **Muñoz R. R.**, Nidever, D. L., & Majewski, S. R. “Kinematics and Metallicities in the Bootes III Stellar Overdensity: A Disrupted Dwarf Galaxy?,” 2009, *Astrophysical Journal*, 702, L9

Majewski, S. R., Beaton, R. L., Patterson, R. J., Kalirai, J. S., Geha, M. C., **Muñoz R. R.**, Seigar, M. S., Guhathakurta, P., Bullock, J. & Rich, R. M., “Discovery of Andromeda XIV: A Dwarf Spheroidal Dynamical Rogue in the Local Group?,” 2007, *Astrophysical Journal*, 670, L9

Chou, M. Y., Majewski, S. R., Cunha, K., Smith, V. V., Patterson, R. J., Martinez-Delgado, D., Law, D. R., Crane, J. D., **Muñoz R. R.**, Garcia Lopez, R., Geisler, D., & Skrutskie, M. F., “A 2MASS All-Sky View of the Sagittarius Dwarf Galaxy: Variation of the Metallicity Distribution Function Along the Sagittarius Stream,” 2007, *Astrophysical Journal*, 670, 346

Sohn, S. T., Majewski, S. R., **Muñoz R. R.**, Kunkel, W. E., Johnston, K. V., Ostheimer, J. C., Guhathakurta, P., Patterson, R. J., Siegel, M. H., & Cooper, M. “Exploring Halo Substructure with Giant Stars. X. Extended Dark Matter or Tidal disruption?: The Case for the Leo I Dwarf Spheroidal Galaxy,” 2007, *Astrophysical Journal*, 663, 960

Rocha-Pinto, H. J., Majewski, S. R., Skrutskie, M. F., Patterson, R. J., Nakanishi, H., **Muñoz R. R.** & Sofue, Y. “The Dog on the Ship: The Canis Major Dwarf as an Outlying part of the Argo Star System,” 2006, *Astrophysical Journal*, 640, L147

Frinchaboy, P. M., **Muñoz R. R.**, Phelps, R. L., Majewski, S. R. & Kunkel, W. E. “Photometry and Spectroscopy of Old, Outer Disk Star Clusters: Berkeley 29, Saurer 1 and BH176,” 2006, *Astronomical Journal*, 131, 922

Majewski, S. R., Frinchaboy, P. M., Kunkel, W. E., Link, R., **Muñoz R. R.**, Ostheimer, J. C., Palma, C., Patterson, R. J., & Geisler, D. “Exploring Halo Substructure with Giant Stars. VI. Extended Distributions of Giant Stars Around the Carina Dwarf Spheroidal Galaxy – How Reliable are They?,” 2005, *Astronomical Journal*, 130, 2677

Frinchaboy, P. M., Majewski, S. R., Crane, J. D., Reid, I. N., Rocha-Pinto, H. J., Phelps, R. L., Patterson, R. J., **Muñoz R. R.** “Star Clusters in the Galactic Anticenter Stellar Stream and the Origin of Old Open Clusters,” 2004, *Astrophysical Journal*, 602, L21

INVITED  
TALKS

ASTROPHYSICAL PROBES OF DARK MATTER, The Center for Cosmology, University of California, Irvine (Irvine, CA), March 24, 2007

THE MILKY WAY HALO - STARS AND GAS CONFERENCE, Argelander Institut für Astronomie (Bonn, Germany), May 29 - June 2, 2007. *I could not attend because I could not renew my VISA in time.*

YCAA SEMINAR, Department of Astronomy, Yale University (New Haven, CT), May 21, 2008

COLUMBIA UNIVERSITY SEMINAR, Department of Astronomy, Columbia University (New York, NY), April 23, 2009

CONFERENCE ON TIDAL DWARF GALAXIES, Physics Centre (Bonn, Germany), May 25 - May 29, 2009

CONTRIBUTED  
TALKS

EXTREME STAR FORMATION IN DWARF GALAXIES, University of Michigan (Ann Arbor, MI), July 29, 2009

MAPPING GALACTIC HALO AND DWARF SPHEROIDAL STRUCTURE WITH GIANT STARS, Dissertation talk at the 211th meeting of the American Astronomical Society (Austin, TX), January, 2008

GLOBULAR CLUSTERS-DWARF GALAXIES CONNECTION, University of Michigan (Ann Arbor, MI), August 29, 2007

THE MAGELLANIC CLOUDS AND DSPH SATELLITES CONFERENCE, University of Vienna (Vienna, Austria), April 12, 2006

UVA ASTRONOMY SYMPOSIUM, University of Virginia (Charlottesville, VA), February 4, 2006

MASS AND MISTERY IN THE LOCAL GROUP CONFERENCE, Institute of Astronomy, Cambridge University (Cambridge, UK), July 21, 2005

CONFERENCE  
PROCEEDINGS

**Muñoz R. R.**, Carlin, J., Chatzikos, M., Hayes, A., Kanneganti, S., Mellon, R., Oishi, J., Park, C., Singhal, A., Sivakoff, G, Majewski, S. R., Skrutskie, M. J. & Sohn, S. T., “Tracing Galactic Metallicity Gradients With the 2MASS Point Source Catalog,” 2004, in “Milky Way Surveys: The Structure and Evolution of our Galaxy,” eds. D. Clemens, R. Shah & T. Brainerd, ASP, 2004, p.283

Majewski, S. R., **Muñoz R. R.**, Westfall, K. B., & Patterson, R. J. , “Dynamics of Disrupting Milky Way Satellite Galaxies and Tidal Streams,” 2005, in “Stellar Astrophysics with the World’s Largest Telescopes: First International Workshop on Stellar Astrophysics with the World’s Largest Telescopes,” eds. J. Mikolajewska & A. Olech, AIP Conference Proceedings, Vol. 752. New York: American Institute of Physics, 2005., p.194-198

Frinchaboy, P. M., **Muñoz R. R.**, Majewski, S. R., Friel, E. D., Phelps, R. L., & Kunkel, W. E., “Star Clusters in the Galactic Anticenter Stellar Structure: New Radial Velocities and Metallicities,” 2005, in “Chemical Abundances and Mixing in Stars in the Milky Way and its Satellites,” eds. L. Pasquini & S. Randich, ESO Astrophysics Symposia (astro-ph/0411127)

Majewski, S. R., Nidever, D. L., **Muñoz R. R.**, Patterson, R. J., Kunkel, W. E., & Carlin, J. L., “Discovery of an extended, halo-like stellar population around the Large Magellanic Cloud,” 2009, in “The Magellanic System: Stars, Gas and Galaxies,” IAU Symp. 256, eds. J. Th. van Loon & J. M. Oliveira, (Cambridge: Cambridge Univ. Press), p. 51

POSTER  
PRESENTATIONS  
AND ABSTRACTS

Frinchaboy, P. M., Majewski, S. R., **Muñoz R. R.** & Patterson, R. J. “The Kinematics and Chemistry of the Sagittarius Dwarf Galaxy Core,” at the 213th Meeting of the American Astronomical Society, Long Beach, CA, Jan 4–8, 2009

Nidever, D. L., Majewski, S. R., **Muñoz R. R.**, Patterson, R. J., Kunkel, W. E., & Carlin, J. L. “The Extended Population of the Large Magellanic Cloud,” in the Bulletin of the American Astronomical Society, Vol. 39, p. 942, 2007

**Muñoz R. R.**, Carlin, J., Chatzikos, M., Hayes, A., Kanneganti, S., Mellon, R., Oishi, J., Park, C., Singhal, A., Sivakoff, G, Majewski, S. R., Skrutskie, M. J. & Sohn, S. T., “Tracing Galactic Metallicity Gradients With the 2MASS Point Source Catalog,” at the 5th Boston University Astrophysics Conference held 15-17 June, 2003 at Boston University, Boston, MA, USA

**Muñoz R. R.**, Majewski, S. R., Kunkel, W. E., Patterson, R. J. & Frinchaboy, P. M., “Exploring the Extended Structure of the Carina dSph: Evidence for Tidal Disruption?,” at the Structure and Evolution of the Milky Way and Its Surroundings Workshop held 5-9 December, 2004 at Ringberg Castle, Bavaria, Germany

Frinchaboy, P. M., **Muñoz R. R.**, Majewski, S. R., “Chemodynamics of Outer Disk Star Clusters: Edge of the Disk or Tidal Debris?,” at the Robert J. Huskey Graduate Research Exhibition, Charlottesville, VA, April 11, 2005

Frinchaboy, P. M., **Muñoz R. R.**, Majewski, S. R., Friel, E. D., Phelps, R. L., & Kunkel, W. E., “The Galactic Anticenter Stellar Structure and Outer Old Open Cluster Origins,” at the 205th Meeting of the American Astronomical Society, San Diego, CA, Jan 9–13, 2005

Frinchaboy, P. M., **Muñoz R. R.**, Majewski, S. R., Friel, E. D., Phelps, R. L., & Kunkel, W. E., “Star Clusters in the Galactic Anticenter Stellar Structure: New Radial Velocities and Metallicities,” at the Chemical Abundances and Mixing in Stars in the Milky Way and its Satellites conference, Grosseto, Italy, Sept 13–17, 2004

Slesnick, C. L., Rhee, J., Kundu, A., Patterson, R. J., Majewski, S. R., Kunkel, W. E., Geisler, D. P., **Muñoz R. R.**, and 4 coauthors, “Properties of Stars Selected by the Grid Giant Star Survey for the Space Interferometry Mission Astrometric Grid” at the 197th Meeting of the American Astronomical Society, 2000

Patterson, R. J., Majewski, S. R., Kundu, A., Kunkel, W. E., Johnston, K. V., Geisler, D. P., Gieren, W., & **Muñoz R. R.**, “The Grid Giant Star Survey for the SIM Astrometric Grid” at the 195th Meeting of the American Astronomical Society, 1999